

FM TECHNICAL REPORT

by

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The technical problems in connection with operation of an FM station by Lehigh University are fourfold: first is the determination of the power class of the license; second, the antenna location; third, the transmitting equipment required; and last, the studio improvements and modifications necessitated by the addition of an FM outlet.

1 Power Class

FM transmitters are divided into three power classes; however, one of these is of such low power and coverage as to be of no interest. Transmitter power in FM broadcasting is evaluated in terms of the actual power output of the transmitter multiplied by effectivity of the antenna; resulting in an "effective radiated power" (e.r.p.). One class of license permits operation up to 1000 watts e.r.p., the other, up to 20,000 watts e.r.p. In theory, either class of license is available to the University. In practice, one or the other may be unavailable as discussed below. The choice between the higher or lower power license is not really a technical one, but must be based upon some compromise between coverage and cost. The higher the power, the greater the area over which Lehigh's programs will be heard, but the greater the cost of the transmitter and antenna. The lower power license operated at its maximum should provide adequate signal strength throughout the Lehigh Valley area (assuming a favorable antenna location); the higher power license should produce adequate signal levels down through much of the Philadelphia area.

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It should be noted that one need not operate at the highest power permitted by the class of license and furthermore, some increase in e.r.p. can be obtained merely by antenna changes with no modification of the transmitter. It should also be noted that minimum power permitted under the high power license is 1000 watts. This is also the maximum power permitted under the lower class license.

The selection of a class of license is further complicated by the fact that FM channels are divided among the power classes. Channel selection must be based upon technical requirements concerning the geographical separation between stations on the same channel, adjacent channels, and second adjacent channels. In order to determine whether or not a given channel is available, one must know the allocation picture within a two hundred mile radius of Bethlehem. Mr. Eustis has compiled one such survey based upon admittedly inadequate data and come to the conclusion that there are two or three channels of each type available in Bethlehem. A more recent survey in Philadelphia appears to imply that there is one channel available and that it is a low-power one. Should permission be received to apply for an FM license, this subcommittee recommends that a professional consultant familiar with FM license requirements be hired to perform the proper survey.

There is one further complication in the selection of the class of license and that is the division of channels between commercial and non-commercial licenses. This again involves the availability of channels; however, as noted elsewhere, a commercial license is to be preferred.

II Antenna Location

The second technical problem to be considered is the location of the transmitting antenna. The location is important because it bears directly upon the quality of the reception, and the extent of coverage of the station. Since FM reception, like television, is best over line-of-sight paths, the antenna should be mounted as high as possible so as to command the maximum amount of terrain. At the same time, since the power criterion is one of effective radiation, the actual transmitter power (and cost) are reduced if the antenna is mounted at a higher elevation. The most satisfactory location for the antenna would be on top of the Bethlehem Steel Company Research Center. This would permit the greatest possible coverage with the least transmitter and antenna expense.

The transmitter must be installed near the antenna; the nearer, the better. Should Bethlehem Steel agree to the location of the antenna on top of the Research Center, a few square feet of floor space within the building would be required to house the transmitter. The only other requirements are for conventional electric power and for some telephone lines to carry the program materials to the transmitter.

There are some alternative antenna sites other than the Research Center, all on South Mountain. The other sites suffer from two common disadvantages; one, they are also on Bethlehem Steel property, and two, there are no buildings at the sites. The latter means that, in addition to the cost of erecting the antenna, a shack must be provided to house the transmitter. Although the shack can be a simple one since the transmitter is to be run unattended, nevertheless, it represents considerable added expense.

Thus, location atop the Research Center is advantageous both technically and economically. It is recommended that, to permit planning other details of the transmitter installation, Bethlehem Steel be approached as soon as possible for permission to locate at the Research Center.

III Transmitting Equipment

There are no direct technical problems in connection with selection of the transmitter since any transmitter used must be approved by the Federal Communications as meeting their standards. There are two recommendations to be made: first, that the equipment be purchased from a manufacturer who will provide onsite supervision of the installation including the checks necessary to satisfy FCC installation standards; and second, that the transmitter be equipped with stereo multiplex equipment. FM stereo broadcasting is relatively new, but potentially important, and it would not pay to consider an installation without it.

IV Studio Improvements

FCC regulations specify the technical standards which must be met by FM studio equipment; much of WLRN's present equipment does not meet these standards. Some of it could be revised easily to improve performance; some will have to be replaced or supplemented by new equipment. The problem is primarily financial and estimates of the costs are given elsewhere. The periodic measurements which must be made to ensure that FCC standards continue to be met are within the capability of the present WLRN technical staff and should be within the capability of their successors.

Certain of these measurements and any transmitter repairs must be made under the supervision of an engineer holding an FCC license. Although it is quite likely that there will always be one or more students around capable of passing the tests to secure such a license, it would be advisable to obtain the standby services of one of the local radio station engineers.

V Conclusions

The most pressing technical problems are the selection of an antenna site and of an operating frequency and power. These should be attended to as soon as possible. The other technical aspects are routine and can be worked out as the need arises for their solution.